

Coping with the relational paradoxes of outcome-based services

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ABSTRACT

By entering outcome-based service (OBS) relationships, industrial service providers and their customers realign their business interests to achieve mutually beneficial outcomes. The move towards OBS represents a shift from transactional to relational interaction between the providers and their customers. Thus, the changed relationship is bound to envelop paradoxes – circumstances that involve competing demands where making tradeoffs can often be impossible. The purpose of this study is to explore such relational paradoxes in OBS relationships and how providers cope with them. An explorative case study approach reveals that the relational paradoxes are related to control, knowledge, dependency, and complexity. Subsequently, we developed a COPE framework consisting of four provider coping strategies: commitment, openness, partnerships, and extrication. Building on the logic of knotted paradoxes, we introduce a quatrefoil knot in which the found relational paradoxes are enmeshed. Finally, we show how different paradoxical tensions become salient at different phases of the OBS relationship while being reinforced by the latent paradoxes at the time. For managers, we disclose relational tensions and their temporal interplay and suggest strategies to cope with them.

1. Introduction

Offering advanced services – instead of manufactured products and transactional services – entails close customer–provider relationships (Kamalaldin, Linde, Sjödin, & Parida, 2020; Raddats et al., 2017). Although mutual reliance may unlock the door to synergies, crossing the doorstep might prove to be more challenging due to contrasting and even paradoxical demands, interests, and ambitions. Paradoxes are persistent tensions between opposing yet interrelated elements (Schad, Lewis, Raisch, & Smith, 2016; Smith & Lewis, 2011). Research shows that paradoxical tensions cannot be solved with tradeoff-like decisions between the opposing tensional elements (Gaim, Wählin, Cunha, & Clegg, S., 2018; Jay, 2013) and that organizations operating under conditions of change or transformation are usually riddled with paradoxical tensions. Paradoxes are also endemic to all business relationships (Håkansson & Ford, 2002). For example, competitors may form alliances to collaborate (Bouncken & Kraus, 2013; Markovic et al., 2020), whereas business partners must engage in joint creation of value while simultaneously protecting their individual interests – namely, value capture (Niesten & Stefan, 2019). Thus, understanding relational paradoxes is becoming an increasingly important topic as servitizing

companies participate in complex inter-organizational settings to drive growth and competitiveness, such as ecosystems (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019; Vargo & Lusch, 2016), open business models (Visnjic, Neely, & Jovanovic, 2018), and outcome business models (Hou & Neely, 2018; Ng, Ding, & Yip, 2013). In particular, we argue that outcome-based service (OBS) relationships are a challenging context ripe for paradoxical situations to emerge due to their unique characteristics. OBS offerings provide customers with service outcomes that the providers guarantee under pain of financial penalties (Liang & Atkins, 2013; Selviaridis & van der Valk, 2019). Thus, the providers assume a significantly greater accountability for achieving the outcomes (Schaefer, Ruffer, & Böhm, 2021; Visnjic, Jovanovic, Neely, & Engwall, 2017). By outsourcing accountability, the customer, on the other hand, becomes increasingly dependent on the provider. Accordingly, OBS relationships spur multiple competing demands and may create challenging relational paradoxes for manufacturers. Yet, prior research has scarcely studied this domain, and several gaps remain.

First, we argue that researching OBS relationships through the paradox theory lens can offer new insights into paradox theory itself and relational paradoxes in particular. This is because paradoxes are woven into their context and time, and they can remain dormant until triggered

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by changes in their environment (Schad et al., 2016; Smith & Lewis, 2011). Such triggers for relational paradoxes can be, for instance, social interactions between individuals (Waldman, Putnam, Miron-Spektor, & Siegel, 2019), teams (Rosso, 2014) or interorganizational partners (Niesten & Stefan, 2019). Thus, a strict focus on a particularly close and long-term service relationship warrants not only discerning its inherent paradoxical tensions but also putting the dynamics between them under scrutiny. An evolutionary perspective on relationships contrasts with top-management-focused inquiries, which often address higher-order strategic paradoxes (see, e.g., Smith & Tushman, 2005) that may develop at drastically different paces. Furthermore, as Cunha and Putnam argue, some aspects of the rapidly growing paradox literature seem to be prematurely institutionalized (Cunha & Putnam, 2019). For example, although many studies highlight interrelatedness as a defining characteristic of paradoxes (Clegg, Vieira, & Cunha, 2002; Schad et al., 2016), fewer studies delve deeper into exploring how they are actually interdependent. Exceptions include Jarzabkowski, Lê, and Van de Ven (2013) who discuss the cascading effects of paradoxes at different organizational levels and Sheep, Fairhurst, and Khazanchi (2017) who suggest that paradoxical tensions are like knots that either exacerbate or attenuate each other. We build on the latter knotted-paradox logic (Cunha & Putnam, 2019; Henriksen, Nielsen, Vikkelso, Bévert, & Mogensen, 2021) by integrating the concept of non-trivial knots that cannot be untied (Hoste, 2005).

Second, there is a clear need for further knowledge on the more persistent tensions in advanced service relationships, such as the OBS. Indeed, the extant servitization research has mostly focused on identifying conditions when OBS offerings are most likely to be successful (e.g., when congruent expectations exist between customers and providers; Ng et al., 2013). In the current paper, we advance the argument that there is more to managing OBS relationships than merely acting according to the identified contingencies. Specifically, we argue that some tensions in the given relationships transcend dilemmas (i.e., difficult but rationally solvable decisions between alternatives; Smith, 2014). The effort to extend knowledge on the more persistent contradictions in OBS relationships is directed at filling an important theoretic gap in the extant research. Here, understanding and coping with paradoxical tensions can help organizations and managers alike to avoid “vicious cycles” (Smith & Lewis, 2011) – namely, undesirable outcomes when attempts are made to solve paradoxical tensions through tradeoff decisions (Niesten & Stefan, 2019).

To address the gaps discussed above, this paper aims to investigate how relational paradoxes are experienced and managed in OBS provider–customer relationships. Accordingly, we conducted an explorative case study of three Finnish OBS provider firms and their experience of customer relationships. Our findings show that relational paradoxes in OBS are related to *control* (contract control vs. informal control), *knowledge* (necessity of knowledge sharing vs. necessity of knowledge protection), *dependency* (individual business goals vs. shared business goals) and *complexity* (difficult to imitate vs. difficult to manage). We also developed a COPE framework that seeks to shed light on how the tensions identified can best be handled. The framework consists of four coping strategies: *commitment* (demonstrating competence and intentions, and leveraging past experiences), *openness* (joint knowledge policing and joint knowledge policy implementation), *partnerships* (reorienting provider identity and further delegating accountability), and *extrication* (compartmentalizing and prioritizing).

We contribute to the literature on OBS relationships (Hypko, Tilebein, & Gleich, 2010b; Visnjic et al., 2018) and relational paradoxes (Håkansson & Ford, 2002; Lannon & Walsh, 2020) in several ways. First, we unveil insoluble relational tensions in OBS relationships and demonstrate how providers cope with them in order to secure continuity in the relationships. Second, by extending the notion of knotted paradoxes (Cunha & Putnam, 2019; Henriksen et al., 2021) beyond trivial knots, we argue that a quatrefoil knot interlaces the found OBS relational paradoxes into an unyielding entanglement. We demonstrate a

four-way interplay between the loops (paradoxes) of the knot by showing how paradoxes evince the tensions of each other in an interconnected manner. Third, we explicate how different paradoxes become salient depending on the phase of the OBS relationship (Sjödin, Parida, Jovanovic, & Visnjic, 2020). For example, the paradox of control was reified in the early stages of the OBS relationship (due to the overemphasis on contract control), whereas the paradox of dependency became more prominent when the scope of the collaboration grew over time (due to overemphasis on shared business goals). Conclusively, the current paper contributes to the knowledge on insoluble relational tensions embedded in OBS relationships (Korkeamäki & Kohtamäki, 2020) and provides guidance on how to cope with their temporal interplay.

2. Theoretical framework

2.1. OBS relationships, tensions, and challenges

This research targets one of the more complex and challenging types of service relationship that often lies at the far end of the transformation process from product-centric to service-centric business logic (Dmitrijeva, Schroeder, Bigdeli, & Baines, 2022). Recognized as the most advanced form of servitization (Grubic & Jennions, 2018; Ng et al., 2013; Visnjic et al., 2017), OBS offerings evidence the shift from a transactional relationship to a relational one between service providers and customers (Sjödin, Parida, & Kohtamäki, 2019). Engaging in an OBS relationship causes the operations and incentives of the contracting parties to intertwine (Visnjic et al., 2018) as the providers and customers realign their value creating and capturing mechanisms to reach the outcomes together (Sjödin et al., 2020). Despite the seemingly straightforward logic, OBS offerings have been found to be a challenging strategy due to numerous tensions. For example, OBS offerings expose providers to significantly higher risks (Hou & Neely, 2018). Yet, multiple studies show that OBS offerings contain noteworthy profit potential for manufacturing firms (Korkeamäki, Kohtamäki, & Parida, 2021; Nowicki, Kumar, Steudel, & Verma, 2008; Patra, Kumar, Nowicki, & Randall, 2019). The customers, by contrast, must maintain a balance between the OBS-related benefit of operational risk transfer and the threat of losing competence (Sjödin, Parida, & Lindström, 2017). Consequently, much of the OBS literature focuses on identifying conditions when OBS offerings are a fitting service strategy. For example, it is frequently emphasized that OBS contracts are more likely to be successful when a high-quality relationship exists between the provider and the customer (Omizzolo Lazzarotto, Borchardt, Pereira, & Almeida, 2014; Randall, Nowicki, & Hawkins, 2011).

However, although relationships are often viewed as a wellspring of competitive advantage (Kamalaldin et al., 2020), the interactions between actors may give rise to paradoxical tensions simultaneously (Håkansson & Ford, 2002). Jarzabkowski et al. argue that “some contexts are more prone to producing tensions than others.” (Jarzabkowski et al., 2013, pp. 245–246). Thus, we contend that arms-length OBS relationships may be an ideal setting to further understand the complex interdependencies of relational paradoxes. Indeed, as the partners work together towards common goals, inter-organizational paradoxes (Niesten & Stefan, 2019; Schad et al., 2016) are likely to emerge because “relational exchange during service encounter causes uncertainties due to conflicts, disputes and so on” (Durugbo & Erkoyuncu, 2016, p. 546).

2.2. A relational paradox perspective on OBS relationships

The current paper looks at OBS relationships through paradox theory lens (Lewis, 2000; Putnam, Fairhurst, & Banghart, 2016). Paradoxes denote persistent contradictions between interdependent elements (Schad et al., 2016, p. 6), such as planning and flexibility (Clegg et al., 2002) or exploration and exploitation (Lannon & Walsh, 2020). Thus, paradox theory contrasts with contingency theory (Gaim et al., 2018;

Jarzabkowski et al., 2013; Kohtamäki, Einola, & Rabetino, 2020), which assumes that tensions can be solved using “either–or” choices to find the best fit (Kohtamäki, Rabetino, & Einola, 2018, p. 188). Conversely, paradox theory asserts that managers should sometimes forfeit tradeoff actions and embrace tenacious tensions as opportunities instead (Beech, Burns, De Caestecker, MacIntosh, & MacLean, 2004). Furthermore, paradox theorists caution that attempting to solve a paradoxical tension by overemphasizing one pole of the paradox (e.g., exploration at the expense of exploitation) can lead to a vicious cycle (Smith & Lewis, 2011). Thus, paradoxical tensions should be coped with instead of trying to solve them (Jay, 2013). Paradoxes have mainly been studied at the organizational level in the general servitization context (Kohtamäki et al., 2018; Kohtamäki et al., 2020).¹ Although valuable, the intra-organizational perspective may disregard the more inter-organizational and relational paradoxes (Lannon & Walsh, 2020; Niesen & Stefan, 2019) that are more sensitive to relationship dynamics, such as evolving partner preferences (Gillier, Piat, Rousset, & Truchot, 2010). Thus, there is a need to further understand the nature and experience of relational paradoxes in close interfirm relations, such as OBS relationships. In essence, relational paradoxes (Håkansson & Ford, 2002) are a product of the intractable “*getting close while keeping a distance*” problem (Raza-Ullah, 2020). Relational paradoxes have received considerable attention in sociology. For example, similar relational tensions (e.g., individual vs. relational goals) have been detected between friends (Rawlins, 1992), romantic partners (Baxter, 1990) and even hostage takers and negotiators (Donohue & Roberto, 1993). Relational paradoxes in industrial relationships, however, have received little attention to date. Given this context, we define relational paradoxes as *persistent and interdependent antinomies between cooperative and uncooperative motives in interfirm relationships*.

Indeed, the relationship between an OBS provider and its customer represents an intimate tie where the two join forces to reach mutually beneficial outcomes (Sjödin et al., 2020), while continuing to protect their interests over time (MacCormack & Mishra, 2015). Thus, OBS relationships are bound to nurture conflicts between aspects such as heteronomy and autonomy (Sumo, van der Valk, van Weele, & Bode, 2016), instrumentality and collaboration (Korkeamäki & Kohtamäki, 2020), and obligatoriness and complementarity (Visnjic et al., 2017). Paradoxes are also interrelated, and scholars have described them as being “bound” together (Schad et al., 2016). For example, Sheep et al. (2017) refer to paradoxical tensions as “knots” that appear in managerial discourse, while Henriksen et al. (2021) researched the interlinked nature of paradoxical knots and found pair-wise correlations (positive and negative) between different paradoxes. Indeed, to co-create value optimally, the customers and providers must not only aim to strike a balance between individualistic and cooperative behaviors but also attempt to avoid dependence asymmetry (Qian, Zhang, & Cao, 2021). However, maintaining the equilibrium throughout the lengthy OBS contract periods (Mouzas, 2016) may be a challenging and continuous endeavor due to unfolding matters, such as experiences, learning, and innovations. This raises the question of whether the OBS-relationship paradoxes all reify concurrently, or whether different latent tensions can become salient in different situations, depending on evolving contextual factors (Smith & Lewis, 2011). Moreover, to further expand the perspective of knotted paradoxes beyond dyadic interlinks between the paradoxes (Henriksen et al., 2021), we draw on the mathematical

theory of knots (Hoste, 2005), which recognizes numerous non-trivial knots with a varying number of connected loops and joined ends that make them impossible to undo (thus, reflecting the persistence of paradoxes). We believe that such a perspective on knotted paradoxes can further illuminate the interrelatedness of relational paradoxes and subsequently help to create new knowledge on OBS relationships. To summarize, we intend to elaborate on entangled relational paradoxes, how they interact, evolve, and are coped with in complex B2B relationships. Through our case study in a servitized context, we aim to answer the call of Cunha and Putnam (2019) by embracing the knotted nature of paradoxes and by developing a process view of relational paradoxes in OBS relationships.

3. Methodology

3.1. Research design

Our research approach of choice is abductive, and our analysis is based on an exploratory case study approach. Thus, our approach “*builds more on refinement of existing theories than on inventing new ones*” (Dubois & Gadde, 2002, p. 559). On the one hand, we aim to develop the theory regarding OBS-related tensions through the paradox theory perspective. On the other hand, we aim to develop the paradox theory by experimenting with relational paradoxes in extremely close collaborative relationships between OBS providers and their customers. The resulting research design was chosen because of the complexity and dynamism characterizing both OBS (Grubic & Jennions, 2018; Hypko, Tilebein, & Gleich, 2010a) and organizational paradoxes (Kohtamäki et al., 2020; Sheep et al., 2017). Multiple case studies are a suitable choice especially when the above-mentioned characteristics are inherent in the phenomenon studied (Eisenhardt & Graebner, 2007). Because paradoxes are socially constructed rather than concrete objective actualities (Kohtamäki et al., 2020; Vaara & Whittington, 2012), our chosen approach captures the social nuances. The research process comprised three phases, which are illustrated in the Appendix 1, Fig. 1. The first phase concerned the selection of cases and data collection. The output of this first phase was primary data to be analyzed as well as secondary data consisting of corporate reports and website information. In the second phase of the research process, an abductive data analysis was conducted using the paradox theory as the theoretical lens. A two-sided data structure resulted from the second phase. Finally, the third phase of the research process involved comparing our empirical findings against the extant OBS research. The output of this final phase is further explored in sections 5 and 6. We first provide details on the cases, the data, and the analysis performed.

3.2. Case selection and data

The current study uses managerial interviews to explore the paradoxes endemic in OBS relationships and how they are handled. The cases selected for this study were chosen on the basis of whether they provided OBS offerings (based on the information given on their website and in their annual reports). Each firm (henceforth, *Omega*, *Gamma*, and *Delta*) had a proven track record of service-centric business development (e.g., dedicated service organization/business unit, global service network, and stated strategic focus on life-cycle service relationships). Some basic characteristics of the case companies, such as the five-year averages of net sales and service share of the net sales, are presented in Table 1. The semi-structured interviews were collected as part of a broader research initiative focused on servitization. The interview themes that were particularly relevant for the current study addressed issues such as the challenges of OBS customer relationship management (in comparison to transactional service relationships) and changing organizational identity. The interviewees were selected based on their titles (ranging from senior managers to strategy directors) and involvement in their firm's servitization activities in general and OBS offerings in particular. The

¹ For example, the organizational (internal) paradoxes in servitization relate to i) efficient customization of solutions and efficient product manufacturing, ii) building customer orientation and maintaining an engineering mindset, iii) organizing product-service integration, and having separate service and product organizations, and iv) explorative innovation in solutions and exploitative innovation in product business (Kohtamäki et al., 2020). We complement this perspective by focusing specifically on relational paradoxes intrinsic to OBS relationships.

Table 1
Case descriptions.

Case	Avg. net sales (M€)	Avg. Services/ Sales	Firm characteristics and the OBS offerings provided	Interview time frame	Interviewees	No. inter-views	Interview length	
							Min.	Pages*
Ω	1215	40.5%	A mining and energy technology provider offering asset performance agreements with bonus options for reached targets or performance-based fee structures.	2014–2018	9	10	533	132
Γ	2962	38.4%	Pulp and paper, and energy technology provider offering performance agreements to improve asset productivity and profitability.	2014–2017	8	8	582	141
Δ	4939	44.3%	An energy and marine technology provider offering operations and maintenance agreements with pricing options based on asset's productive lifetime and return on investment, and fleet management, operational efficiency improvement, and reliability services.	2014–2018	8	8	561	151
*Times New Roman 12, single space, 2.54 margins all around				TOTAL	25	26	1676	424

interviews from the three companies cover a five-year span (from 2014 to 2018), and there were 26 in total (1676 min and 424 pages of transcriptions). Only one out of 26 interviewees was interviewed twice (an *Omega* respondent, in 2017 and in 2018) and the interview duration varied from 46 min to 145 min (the average interview length was 64 min). Due to confidentiality, the respondents could not go into details regarding the development of individual customer relationships over the years. Our secondary data consisted of annual reports of the case companies (Omega: from 2010 to 2018; Gamma: from 2013 to 2018; Delta; from 2010 to 2018) and their website information. The secondary data were used mainly to evaluate the suitability of the cases for our inquiry, to situate the interviewees' responses in their firms' industries, and to generate a general understanding of the firms' customer segments related to OBS offerings. The total length of the corporate reports

extended to 3684 pages.

3.3. Data analysis

The analysis followed the suggestions advanced by the Gioia methodology (Gioia, Corley, & Hamilton, 2013), where we first identified common words, terms, and phrases that form the first-order observations emerging directly from the data (see Appendix 2, Table 2 for first-order observations of paradoxical tensions and Appendix 3, Table 3 for first-order observations of coping practices). Following the guidelines of multiple case studies (Eisenhardt & Graebner, 2007; Gehman et al., 2018), we started with the within-case analysis where case-specific tensions in the discourse of the managers immediately surfaced. Naturally, not only tensions but also coping approaches were discussed. This

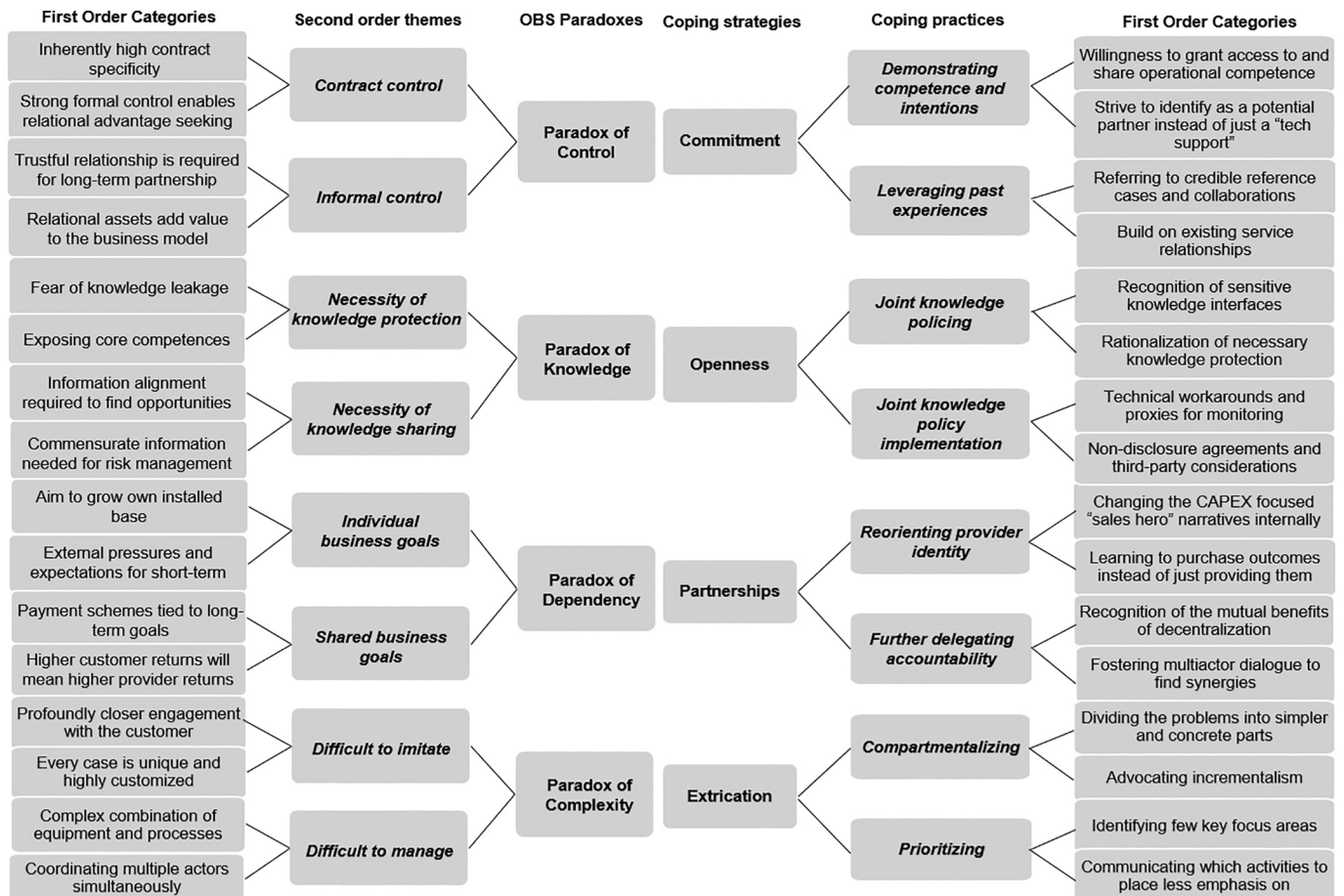


Fig. 2. Data structure.

led us to expect a two-sided data structure (Nag, Corley, & Gioia, 2007) to begin with. The initial analysis was conducted by one researcher who, after the within- and cross-case analysis, validated his interpretation with the other authors. Next, a cross-case analysis was performed. To be sure about the persistence and reciprocity (Putnam et al., 2016) of the tensions, we paid close attention to differentiating the solvable dilemmas (Smith & Lewis, 2011) and the less puzzling “regular” tensions from the paradoxical ones. For instance, due to the differences between conducting transactional and relational business, the importance of a dedicated service organization was emphasized. To address this arguably solvable tension, *Gamma* and *Delta* had a central services unit in place throughout the study’s time frame, whereas *Omega* had established one in 2017. Because case-wise variability regarding the paradoxical tensions was surprisingly minute (with differences related mostly to the context-specific examples used), we focused on detecting the patterns that all the cases had in common. The cross-case uniformity (similar sources of tension and coping praxis) allowed us to confidently group the first-order observations into second-order themes (see the illustrative quotations in Appendix 4, Table 4). Looking at the paradox side of the data structure (Fig. 2), the second-order themes formed pairs of opposing tensions. The identified coping practices, on the other hand, did not emerge as opposite approaches. Lastly, the second-order themes were conceptualized into third-order dimensions, which the researcher conducting the analysis again validated with the other authors. After the data had been inspected through the paradox theoretical lens (P2 in the Appendix 1, Fig. 1), we compared the tensions that we found against the extant OBS research (P3 in the Appendix 1, Fig. 1). Although the tensional elements had been previously identified in the OBS literature, the interconnectedness and paradoxical nature between the elements had not previously been conceptualized, and many of the coping practices were novel. This theoretical triangulation (or systematic combining) not only buttressed our interpretation but also helped in bridging the two theories used.

4. Findings

4.1. Experiencing and coping with the paradox of control

The paradox of control emerges because of the tension between strict formal control that is endogenous in OBS and the informal control needed to create and maintain a long-term partnership. The tension is paradoxical because, if perfectly specifiable contracts could exist, there would be no need for informal control, such as trust. Conversely, if informal control could completely prevent opportunism, formal contracts would become obsolete. In practice, actors cannot realistically choose between the two; thus, the tension is paradoxical. The given paradox can be further elaborated through case evidence. Although high contract specificity aims to protect the parties from relational opportunism, strict contracts may actually promote relational advantage seeking at the outset of the relationship, as emphasized by the *Delta* manager “...when the owner says they want their own office on the site, then we know it’s this kind of shorter operation project. This is one group.” (Δ6). Thus, OBS providers need to accept that customers may require them to operate and maintain the purchased system with the intention of leveraging a learning opportunity. Since the operated asset, such as a production facility, is often owned by the provider, this conduct is evidently legal. Therefore, OBS providers may enter agreements well aware that their operational competence is not only going to be accessed but also strategically leveraged.

Because the inherently high contract specificity of OBS makes discontinuing service agreements legally straightforward, the managers who were interviewed emphasized the importance of informal control, as an *Omega* interviewee elaborated: “...a proper, genuine commitment needs to be there because, with these, it’s almost like a holy matrimony with the customer when we enter these agreements. So, trust must be there.” (Ω3). If trust in the partner’s commitment is the bond strengthening the

marriage between provider and customer, contract control performs the function of a prenuptial agreement, metaphorically. For example, although OBS relationships are characterized by long-termism, our interviewees stressed that the contracts are not designed to be stagnant but rather include review periods (e.g., a fiscal year) to consider revising the terms in case of experienced unfairness. Returning to the operational competence aspect discussed above, the provider has little means to exercise formal control in the given instances. As advanced technical systems, such as paper mills, would be a major burden in the balance sheet of a publicly listed manufacturer, they cannot protect operational competence through ownership. Rather, they must seek the means to leverage informal control. In this effort, reference cases with other customers and accumulated use of data and previous experiences (either with the customer or other customers) were found to be indispensable sources of relational capital. In the context of our cases, all three firms have long-standing histories and market-leader positions in their respective core businesses. Thus, building OBS relationships on existing customer relationships was emphasized by the interviewees as an almost natural continuum, mitigating the pressures caused by the simultaneous and persistent tensions between formal and informal control: “*And then also to have a proper understanding and personal chemistry with these people. Because it’s important not only that we find the key targets to create value through these services but also that personal chemistries work well together. Because this is people-to-people business.*” (Γ3).

Undeniably, the paradoxical tensions between formal and informal control require a considerable capacity to adapt on the part of the OBS providers. As the providers cannot solve the ever-perpetuating tension whilst the OBS relationship continues to exist, they can merely try to cope with it. We found that our case companies aim to cope with the tension by demonstrating competence and positive intentions – for example, by having regular, face-to-face meetings with customers to foster the development of relationships that are beyond strictly professional (“...if you don’t have the patience to allow the professionals to grow together, you can’t expect to see ultimate successes” Δ5) and by leveraging past experiences. In other words, the OBS providers cope with the paradox of control by exhibiting their commitment to being a value-adding partner not only temporarily but also going forward into the future.

4.2. Experiencing and coping with the paradox of knowledge

An inherent feature of OBS offerings is that they often focus on critical customer processes. To manage the risks related to the given processes, service providers require in-depth knowledge. Thus, knowledge sharing is critical for successful OBS delivery: “*And all these require digital solutions, but they in a sense come via the business model. Different parties need different knowledge.*” (Δ4). As emphasized by the *Delta* manager, information technology is a significant aid to knowledge sharing. For instance, prediction, proactivity, and responsiveness would not be possible without remote connections and a commensurate amount of information. However, given the criticality of the processes managed, not all information and knowledge can be shared but must be carefully protected instead. Because neither the provider nor the customer can choose between strictly protecting and completely revealing knowledge, the paradox of knowledge emerges. For instance, *Omega* respondents stressed that some customers, such as mining companies, must protect sensitive, production-related knowledge connected to their individual business performances. Thus, a strict policy of non-disclosure agreements is advised: “*But when you start to get below the mill, then you start to see the recovery, how much is the production of copper or gold and silver. The further down you go, so you go below the smelter, the customers normally don’t want anyone to see how much they are producing and how the operation is working. Normally, the NDAs are thicker than the contract, just to protect themselves. And they don’t want any connection, like in the lower part of the refineries they don’t want any, say, digitalization from a third-party vendor.*” (Ω8). Indeed, the tensions between knowledge

sharing and protection concern not only the dyadic relationship between provider and customer but also third-party interfaces. This is important especially in the context of advanced technical systems because rarely do high-tech companies compete without alliances, partnerships, and joint ventures. Thus, the paradox of knowledge is closely interlinked with the paradox of dependency, which will be discussed in section 4.3. Given the strategic and sensitive nature of knowledge, both shared and protected, maintaining the balance is an intricate process that requires multiple approaches. For example, Omega respondents raised multiple technology-oriented ways in which the sensitivity of production-related information can be addressed by developing means of measuring less-sensitive parameters during service delivery: “When we get those cooling elements in the smelter, we get tons of information regarding the current state of that smelter. Just by measuring the cooling water circulation.” (Ω3).

In addition to the product-centric technical workarounds elaborated by an Omega respondent, other respondents placed emphasis on more relational management aspects, such as the need to keep parties motivated regardless of the knowledge-protection practices. In this effort, informing the parties of each other's rationales for protecting certain information was underscored by the managers. This aspect further amplifies the paradoxical nature of tensions between knowledge sharing and protection, since information should be shared on why information is not being shared. The given coping paradox is a good demonstration of joint knowledge policing between the OBS provider and its customer. The competing tensions were well summarized by a Gamma manager: “So, knowledge actually comes from multiple channels. It comes from our side but also from the customer's systems... We've had discussions with customers that you will get some if you give some. This is the principle if you give nothing you can't really expect much in return.” (Γ3).

To summarize, both knowledge sharing and protection are paramount for successful OBS delivery, reinforcing the paradox of knowledge. To cope with the consequent tensions, both provider and customer must “engage in an analytical dialogue with the customer” (Δ7) to develop a joint knowledge policy based on the recognition of sensitive knowledge interfaces. To implement and enforce the policy, alternative monitoring options, NDAs, and third-party implications must be carefully considered. Both sides should fundamentally aim for as high a degree of openness as possible to effectively achieve their shared business goals. Furthermore, because knowledge gaps cannot always be detected before the service enters the delivery phase, policy making must be developed into continuous and adaptive practice “In the beginning it's more... about putting out fires. Then, as soon as possible, you should start developing practices by which proactivity and measurability in maintenance is implemented” (Ω5). In sum, we coin the provider's coping strategy as “openness” because it depicts the provider's struggle to achieve unreservedness in the face of the pressing need to protect knowledge.

4.3. Experiencing and coping with the paradox of dependency

“The closer the business relationship with our customer is, the greater the extent of mutual dependence it will entail. And the mutual responsibilities as well... As already mentioned, the customer too should develop its own operations.” (Γ1). As effectively summarized by a Gamma interviewee, dependency is an integral element of OBS offerings. In particular, dependency causes paradoxical tensions because the OBS participants enter a long-term agreement with shared business goals, while simultaneously continuing to pursue their own independent business goals, for which short-term wins are demanded by the owners. On the other hand, it is demonstrable that shared business goals mean that the higher the customer gains, the higher the provider gains, correspondingly. If the scope of the collaboration between the partners broadens (e.g., due success and good experiences), the paradox of dependency is prone to intensify as the relationship progresses. The given setting causes tensions internally for the providers to change the deep-rooted “sales hero” narratives typical of equipment manufacturers (large, transactional CAPEX deals are emphasized above the more long-term OPEX

activities). On the other hand, the provider's business activities apart from the OBS activities (such as equipment and spare parts sales) may in fact work in favor of the OBS customer. This is because the customer is often highly dependent on the provider's capabilities to achieve the commissioned outcomes, especially in terms of highly specific technological niches. Subsequently, if the provider's individual business performance is based on only the typically high-risk OBS contracts, there is a danger that the provider will no longer be available if the many risks suddenly materialize: “Because in a certain way, operators (providers) also want to ensure the continuity of their own operations and that is in a way beneficial for the customer. That it isn't so, that there are some operators that have, let's say, two big contracts and, if those contracts are unsuccessful, they go 'kaput' so to speak.” (Ω2).

In other words, it is in the interest of the customer that the provider has other separate individual business goals to pursue simultaneously with those that are shared. Furthermore, due to the importance of the shared business goals for the provider's service strategy (e.g., growing the service sales share of total revenues) and individual business goals (e.g., growing and protecting own installed base), the provider greatly depends on the customer's individual business goals as well. Thus, both customer and provider have their distinctive individual business goals following different routes, which continue to coexist side by side with the shared OBS business goals. As long as the OBS relationship continues to exist, providers cannot choose between these goals but must pursue both. In effect, once providers become more dependent on their customer's business outcomes, they must reassess their identity as providers and assume one that is closer to that of their customer – in other words, they must learn to purchase outcomes themselves: “...so, how do we, Omega, transfer some of the responsibilities to the network of subcontractors so that they principally work to achieve the same goal. That it isn't so, that we buy a certain resource for an hourly price, but that there would be these sorts of production and maintenance-based metrics with which we measure the supplier's quality.” (Ω10).

Thus, in an effort to cope with dependency by adjusting the course to better align with its customer, the OBS provider actually becomes an OBS customer himself. Importantly, further delegating the risks will not only add to the dependency but it will also have effects from the control, knowledge, and complexity perspectives. Subsequently, Delta managers often stressed the importance of applied design thinking, where not only the OBS customer and provider participate but also the wider ecosystem actors. For instance, outcome measures, such as fuel savings (e.g., in the ship power business), will most certainly depend on ecosystem actors beyond the provider's control (helmsmen, captains, currents, weather etc.). Thus, in order to cope with dependency, both providers and customers must recognize the mutual benefits and the importance of diversifying dependency: “And then, quite often, we involve third-party equipment in our deliveries” (Ω3). However, although network collaboration seems like a facet helping to cope with dyadic dependency, it will further complicate the already complex business model because along with it comes “the added complexity from a sort of business-risk and execution-responsibility point of view.” (Δ1). Effectively, the paradox of dependency is firmly tied into the final OBS paradox found – namely, complexity.

4.4. Experiencing and coping with the paradox of complexity

All the case companies investigated in the current study provide rather advanced systems and technologies, such as power plants, paper and pulp mills, and mining equipment. Thus, the companies studied are no strangers to complexity and multi-layered interconnectedness. Nevertheless, beyond the complexity of the physical assets, interviewees in all the case companies emphasized how the more socially derived complexity inherent in OBS offerings may be a major source of paradoxical tensions. First, because OBS offerings entail very close collaboration between provider and customer, the solutions constructed are often highly tailored to the varying sets of intricate customer needs: “... ”

we don't deal only with our own technology, so our customers' requirements are no longer solely related to those technologies but more to the shared goals." (Γ1).

Accordingly, OBS providers leverage the closer collaboration with the customer to customize "a more complex and more comprehensive value proposition" (Δ7). Understandably, the high customization based on customer proximity results in a competitive edge for the providers in the sense that the case-specific configurations of physical and intellectual assets are difficult for competitors to imitate. On the other hand, the complex customization causes adverse effects as well. For example, reflecting the paradox of dependency discussed above, not only are the technical systems involved complex but so is the structure of the stakeholder network. In other words, the more diverse the equipment, suppliers, and units involved, the more difficult managing the outcome production processes become. In addition to stakeholder-related complexities, a factor that amplifies the negative tension of complexity for the providers responsible for OBS delivery is the industry risk the customer faces, as emphasized by the Omega interviewee: "And these are reflected in practical activities in a way that, when we operate as a provider in a highly cyclical industry, our resource usage and structure must be extraordinarily flexible in order that we can adapt pretty quickly to changes in the market environment by adapting costs but ways of working as well." (Ω4). Thus, in order to capitalize on the complexity-induced inimitability, the OBS provider must learn to cope with the negative aspects of complexity. Our findings highlight two specific coping practices. First, the interviewees emphasized how the problems encountered must be split into smaller, approachable segments that can be addressed incrementally. Second, prioritization of the problems facilitates focusing on urgent issues but also helps to detect less urgent issues from which the focus can be redirected. Accordingly, the seemingly established way of dealing with complex problems in each of the case companies was to process the variety of information into more manageable parts and address them separately and iteratively: "we choose some segments to start with and see what would be a strategic area where we want to test and pilot." (Δ4).

5. Discussion

This paper investigated *how relational paradoxes are experienced and managed in OBS provider–customer relationships* through a case study of three Finnish OBS provider firms and their experiences from customer relationships. Our findings show that relational paradoxes in OBS are related to control (contract control vs. informal control), knowledge (necessity of knowledge sharing vs. necessity of knowledge protection), dependency (individual business goals vs. shared business goals) and complexity (difficult to imitate vs. difficult to manage). In addition, we identified how the tensions identified can best be handled. Our findings presents four coping strategies: commitment (demonstrating competence and intentions, and leveraging past experiences), openness (joint knowledge policing and joint knowledge policy implementation), partnerships (reorienting provider identity and further delegating accountability), and extrication (compartmentalizing and prioritizing). Investigating our findings in further detail has allowed us to disentangle interrelationships and the dynamics of paradoxes. In the following sections, we discuss our findings in relation to the *interrelatedness* and *temporality* of relational paradoxes.

5.1. Interrelatedness of the relational paradoxes

A core theme in our analysis relates to the interrelatedness of relational paradoxes because, as Cunha and Putnam (2019) argue, the interrelatedness of paradoxes is an aspect that many authors emphasize (e.g., Hahn, Pinkse, Preuss, & Figge, 2014; Lewis, 2000; Putnam et al., 2016) but few authors explore and explain. In their recent paper building on the knotted paradoxes perspective (Cunha & Putnam, 2019), Henriksen et al. (2021) argued that paradoxical knots come in pairs (e.

g., management vs. leadership *plus* passion vs. performance). By analyzing the interrelatedness of the paradoxes that underpin the OBS relationships investigated, we extend the knotted paradox perspective and introduce the concept of the quatrefoil knot (Hoste, 2005) that interlaces all four paradoxes found (Fig. 3). Thus, we argue that the interrelations between paradoxes are not limited to pairwise connections only. Rather, the knot between the paradoxes is a more complicated one through which all the paradoxical tensions crisscross. We now provide some examples of the four-way interplay between the paradoxes in our study's context – namely, servitization and OBS relationships.

For example, the tension between knowledge sharing and protection is firmly interwoven with complexity, dependency and control. It is typical that OBS offerings center on highly complex product–service (and often software) systems (Kreye, Roehrich, & Lewis, 2015; Ng & Nudurupati, 2010), which presupposes a need for knowledge sharing (Sjödin et al., 2017). However, the intrinsic complexity may, in turn, contribute to greater knowledge asymmetry between parties: "Because the customer ... may lack knowhow of technical specs and developments, [the provider] could seize the opportunity to gain advantage based on the customer's dependency" (Korkeamäki & Kohtamäki, 2020, p. 201). Indeed, due to the complexity of OBS offerings, the provider could exercise knowledge- and dependency-derived power opportunistically beyond the customer's control. The given interplay between the tensional elements elaborates both the relational (Håkansson & Ford, 2002) and knotted (Cunha & Putnam, 2019) nature of the paradoxes. However, it is not only the provider who can compromise the relationship's mutual successfulness by favoring the knowledge protection pole of the knowledge paradox. Indeed, customers may be reluctant to share knowledge that is paramount for achieving the outcomes: "the provider may be required to provide core and detailed information without getting key information back from the customer, though this information may largely influence the outcomes" (Hou & Neely, 2018, p. 2111).

Similarly, the paradox of complexity (difficult to imitate vs. difficult to manage) is nourished by tensions related to dependency, knowledge, and control. For example, as the customers depend on the provider to deliver complex performance (Caldwell & Howard, 2014), they demand detailed NDAs in order to prevent leakages of specialized knowledge that the provider could leverage to develop capabilities for selling on to competitors (Sjödin et al., 2017). On the other hand, the lock-in with the customer is an advantage for the provider, since the first-hand knowledge of the complexities related to customer operations lock out competitor offerings (Visnjic et al., 2017). At the same time, our findings suggest that OBS offerings rarely are the only business model the provider and the customer are engaged in. Thus, the typical scenario is that, despite the mutual OBS relationship, both continue to maintain their separate individual business goals and shareholder demands. Although the parties can alleviate their intense dyadic dependence by delegating

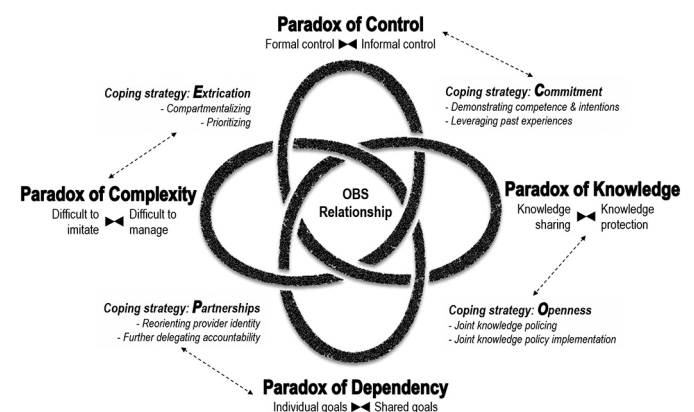


Fig. 3. Quatrefoil knot of OBS-relationship paradoxes and COPE framework of provider coping strategies.

accountability further (the coping strategy of partnerships), adding third-party connections will add to the complexity of an already complex business model (Hypko et al., 2010b), making its management even more difficult. For example, new control (informal vs. contract control) considerations will commence when new actors enter the business model. The aforementioned examples show that it is nearly impossible to discuss the implications of one paradox without referring to the others. In other words, one paradoxical loop – through its four-way connections to the other loops – may work as a medium for the effects of the others. Nevertheless, which paradox becomes salient at a particular point of time will depend on changing contextual factors and triggering activities, as discussed in the following segment.

5.2. Temporality of the relational paradoxes

We identified temporal dynamics among the relational paradoxes (see Fig. 4). Our results support the view that paradoxes can remain latent until changes in their environment trigger them (Smith & Lewis, 2011). On the other hand, salient tensions may regress to a dormant stage if neither of the poles of the paradox is emphasized excessively – that is to say, the tension can be alleviated by coping practices (Smith, 2014; Smith, Binns, & Tushman, 2010). In the relational context, we argue that changes triggering relational paradoxes can include the establishment of relationships, emerging conflicts, and growing reliance. For example, our findings posit that the paradox of control manifests itself particularly at the outset of OBS relationships when the contracts are being established. This is because, as an Omega respondent put it: “at that point, you want to minimize the risks by crafting good contracts.” (Ω5). This is why the “contract control” pole of the paradox is often emphasized at the expense of the informal control. However, the paradox of control is largely reinforced by the other found paradoxes: appropriate non-disclosure of knowledge must be ensured (Sjödin et al., 2017), a balance between individual and mutual gains must be agreed (Sjödin et al., 2020), and the complexity of contract customization must be kept under control to make the contracts revisable (Selviaridis & van der Valk, 2019). Aligned with prior research, our findings suggest that the providers cope with the paradox by demonstrating their competence and intentions (Korkeamäki & Kohtamäki, 2020) and by leveraging the existing key customer relationships (Ulaga & Eggert, 2006) when introducing OBS offerings (the coping strategy of commitment).

Despite fragmentary transmission through the paradox of control, the other paradoxes can remain latent until the relationship progresses to the service delivery phase (Sjödin et al., 2020). As the shared operations begin, both the customer and the provider start to acknowledge the complexities of the relationship in practice: “at the contract implementation stage, there can be gaps in understandings of each other’s business processes, resulting in complexity, confusion and even delivery failure” (Hou & Neely, 2018, p. 2111). Thus, the paradoxes of knowledge and complexity intensify concurrently. The “difficult to manage” pole of the paradox of complexity can become overly emphasized as all the factors influencing the outcomes start to unfold. The “knowledge protection” pole of the paradox of knowledge can become dominant as the customer typically aims to share as little knowledge as possible, although it might have an adverse effect on achieving the outcomes (Hou & Neely, 2018). Both salient paradoxes are fueled by the latent paradoxes. For example, the detailed contracts (formal control) can complicate reacting to emerging issues if one needs to consult a lawyer to ensure they are not violating the contractual terms (e.g., Can the customer’s personnel carry out repairs if they detect urgent deficiencies, even if the provider is responsible for the repairs?). Furthermore, firms protect crucial knowledge from their partners since oversharing can make them more dependent on the receiving actor (Sjödin et al., 2017) and increase the switching costs (Frank, Mendes, Benites, & Ayala, 2022). To cope with the salient paradoxes, actively policing what knowledge can be informally shared and what must be formally protected (the coping strategy of openness) and breaking complex problems into more manageable parts and prioritizing them (the coping strategy of extrication) were the strategies highlighted by our interviewees.

Finally, based on our findings, we argue that if the partners manage to cope sufficiently with the tensions described so as to avoid vicious cycles (Schad et al., 2016; Smith & Lewis, 2011) that may compromise the continuity of the OBS relationship, the extent of the co-creation between the partners may extend to cover additional facilities, sites, or even entire fleets. In this case, the mutual reliance between the partners intensifies, bringing about the paradox of dependency. Given the increased mutual reliance, the “shared business goals” pole of the paradox may gain favor over the individual ones. For example, the provider might express negligent behaviors towards other customer segments of lesser strategic importance or exaggerate resource dedication to the OBS relationship. Both examples can arguably trigger further

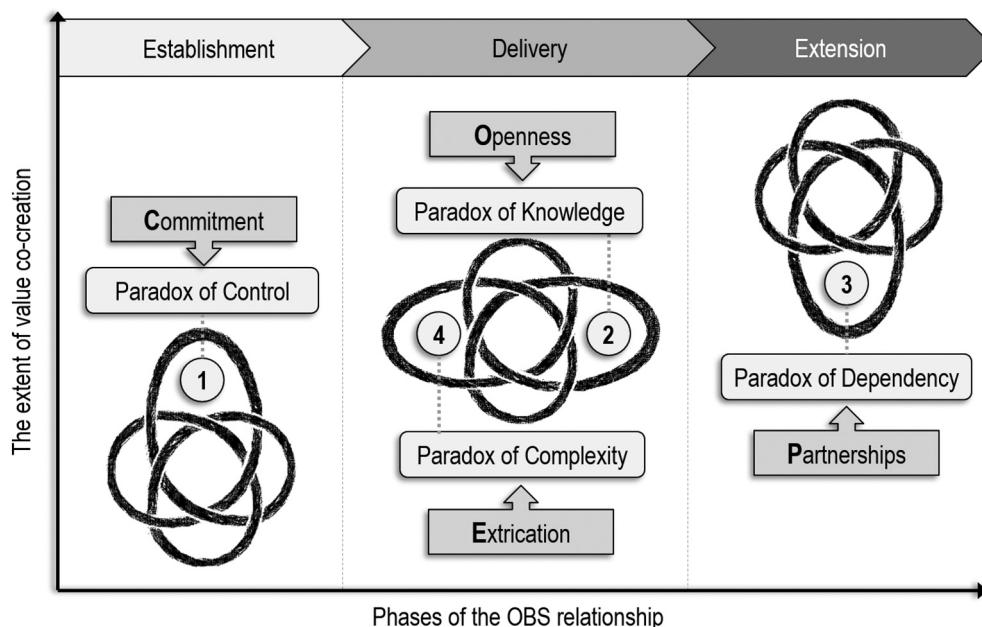


Fig. 4. The dynamics of the paradoxical tensions (and coping strategies) as the OBS relationship evolves.

negative reactions, such as increased churn (Tamaddoni Jahromi, Stakhovych, & Ewing, 2014) and demotivation of employees (Nohria, Groysberg, & Lee, 2008) working with the “less important” customer segments. The paradox of dependency also draws from the other latent loops of the quatrefoil knot. For example, the operation of additional facilities increases the complexity and, thus, the need for knowledge sharing. Importantly, the more dependent on each other the partners are, the greater the importance of mutual trust and fair contract terms. To alleviate the tension of increasing dependency, the providers advocated a coping strategy of partnerships (learning to act as OBS customers and thereby diversifying accountability).

6. Conclusions

6.1. Theoretical contribution

Our paper offers a number of contributions to theory on OBS and relational paradoxes. First, we provide a more nuanced perspective on OBS relationships by disentangling the experience and management of relational paradoxes. The extant OBS literature tends to underline the positive aspects of relationships, such as complementarity (Visnjic et al., 2017), regular exchange (Ng et al., 2013) and trust (Korkeamäki & Kohtamäki, 2020). Nevertheless, business relationships may also spur tensions between partners (Håkansson & Ford, 2002), some of which cannot be solved by straight-forward tradeoffs (Kohtamäki et al., 2020; Smith & Lewis, 2011). For example, the partners must constantly maintain balance between individual and mutual gains (Niesten & Stefan, 2019) to avoid the dissolution of the relationship. The necessity of the “both-and” approach implies the presence of relational paradoxes (Håkansson & Ford, 2002). We defined relational paradoxes as *antinomies between cooperative and uncooperative motives in interfirm relationships*. Because paradoxes persist and cannot be solved using either-or choices (Lewis, 2000), managers should learn to identify, accept, and cope with them (Jay, 2013). Thus, we propose a COPE framework consisting of four coping strategies (*commitment, openness, partnerships, and extrication*).

Second, we demonstrate the interrelatedness of relational paradoxes in OBS by illustrating complex dynamics between the loops of the quatrefoil knot. Indeed, recent theoretical discussions stress that paradoxes are interrelated in a knotted manner (Cunha & Putnam, 2019; Henriksen et al., 2021; Manzonja & Volker, 2017). Namely, one paradoxical tension typically either exacerbates or alleviates another and vice versa (Sheep et al., 2017). The relational paradoxes identified in the current study enforced each other. For example, growing mutual dependency between OBS providers and their customers typically stimulated a growing conflict between informal and formal control (i.e., the paradox of control). Whereas earlier studies have focused on pairwise knotted interactions between paradoxes (e.g., Henriksen et al., 2021), we differ by integrating the concept of non-trivial knots from the mathematical theory of knots (Hoste, 2005). A quatrefoil knot, in which the four found paradoxes are enmeshed, serves as an interchange through which the tensions of other paradoxes may be transmitted through another paradox. Returning to the previous example, the growing dependency between the OBS partners may not only amplify the paradox of control but can also be catalyzed by knowledge asymmetry, for example (Hou & Neely, 2018; Korkeamäki & Kohtamäki, 2020). To fan the flames, all the above can add to the inherent complexity of OBS relationships (Caldwell & Howard, 2014). By demonstrating the four-way interplay and the unyielding entanglement between the paradoxes, our second contribution extends the notion of knotted paradoxes (Cunha & Putnam, 2019) beyond trivial entanglements.

Finally, we suggest a process view of the manifestation of relational paradoxes in OBS. Indeed, paradoxes can remain “latent” until changes in their environment trigger them (Dmitrijeva et al., 2022; Smith & Lewis, 2011). Naturally, an initial trigger that brings relational paradoxes to the surface is to become engaged in a relationship. We found that, in the beginning stage of OBS relationships, it is the paradox of

control that grows particularly immense, drawing on the loops of the other paradoxes. As the collaboration progresses, bottlenecks regarding knowledge sharing and protection may start to emerge (Hou & Neely, 2018; Visnjic et al., 2017), which not merely adds to the OBS-related complexity but is also driven by it. Lastly, given that the previously surfaced tensions are managed appropriately, the scope of the collaboration between the provider and customer may bring about increased dependency. Thus, our third contribution is to answer the call of Cunha and Putnam to develop a “strong process view” (Cunha & Putnam, 2019, p. 102) of the dynamics in the quatrefoil knot as the OBS relationships evolve over lengthy contract periods (Korkeamäki et al., 2021; Sjödin et al., 2020). Taken together, our contributions generate valuable new knowledge on the management of OBS relationships and the associated relational paradoxes.

6.2. Managerial implications

A considerable body of knowledge exists on the either-or choices for companies involved in OBS relationships. Less knowledge exists on how senior managers in manufacturing companies cope with the insoluble tensions caused by the OBS relationships. Consequently, we offer OBS managers a coping strategy framework called COPE. First, the coping strategy of commitment is needed to mitigate the paradox of control. It is recommended that OBS providers pursue a commitment strategy by building OBS relationships with those customers with whom they have had existing and long-standing customer relationships. In these relationships, the focus needs to be on demonstrating the provider's value-adding competence and positive intentions in order to mitigate the risk of opportunism. Secondly, to cope with the paradox of knowledge, we recommend that OBS providers aim for increased openness through active knowledge policing with the customer and by instituting liabilities for any policy breach. Third, to cope with the paradox of dependency, OBS providers should employ the coping strategy of partnerships, by which they should aim to further delegate accountability and learn to purchase outcomes instead of merely providing them. Fourth, to cope with the paradox of complexity, we recommend that OBS providers compartmentalize issues into smaller, more manageable slots and prioritize between the slots to allocate resources to where they are most needed. Lastly, we stress that certain tensions are likely to become more pressing in different phases as the relationship evolves and that addressing this dynamicity may require different coping practices in the various phases of the relationship.

6.3. Limitations and future research

Our findings are based on interviews in three case companies that have longstanding experience with industrial service offerings. Thus, our findings on, for example, coping practices may be pertinent to the manufacturers of the kind mentioned. For example, despite being considered anomalous, so-called “born solution providers” (Saul & Gebauer, 2018) may face fewer puzzling tensions when delivering OBS offerings to their customers because they may lack the burden of a product-oriented manufacturing legacy. On a related note, our findings are based on insights from providers and not customers. Thus, further validation of our findings is needed from a customer point of view. On the other hand, our conceptualization of the interconnections between the paradoxes may prove helpful in this effort. Thus, we recommend that researchers inspired by paradox theory adopt the knotted perspective on paradoxes, so that they can hopefully discover even more delicate knots (e.g., the cinquefoil knot) than the quatrefoil knot of OBS paradoxes that we identified in this paper. Having said that, we must stress that developing the paradox theory based on the knot perspective should not be relegated into a competition of who discovers the most sophisticated knot. The knot perspective can only add value to the extent that it helps in the effort to explain interconnections. After all, the notion of the interrelatedness of paradoxical tensions (Jarzabkowski et al., 2013) does

not necessarily imply that all paradoxes are, in fact, interrelated. Finally, even if the quatrefoil knot connects the coping strategies to each other through their paradox counterparts, the interconnections between the strategies warrant further research.

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Appendix 1

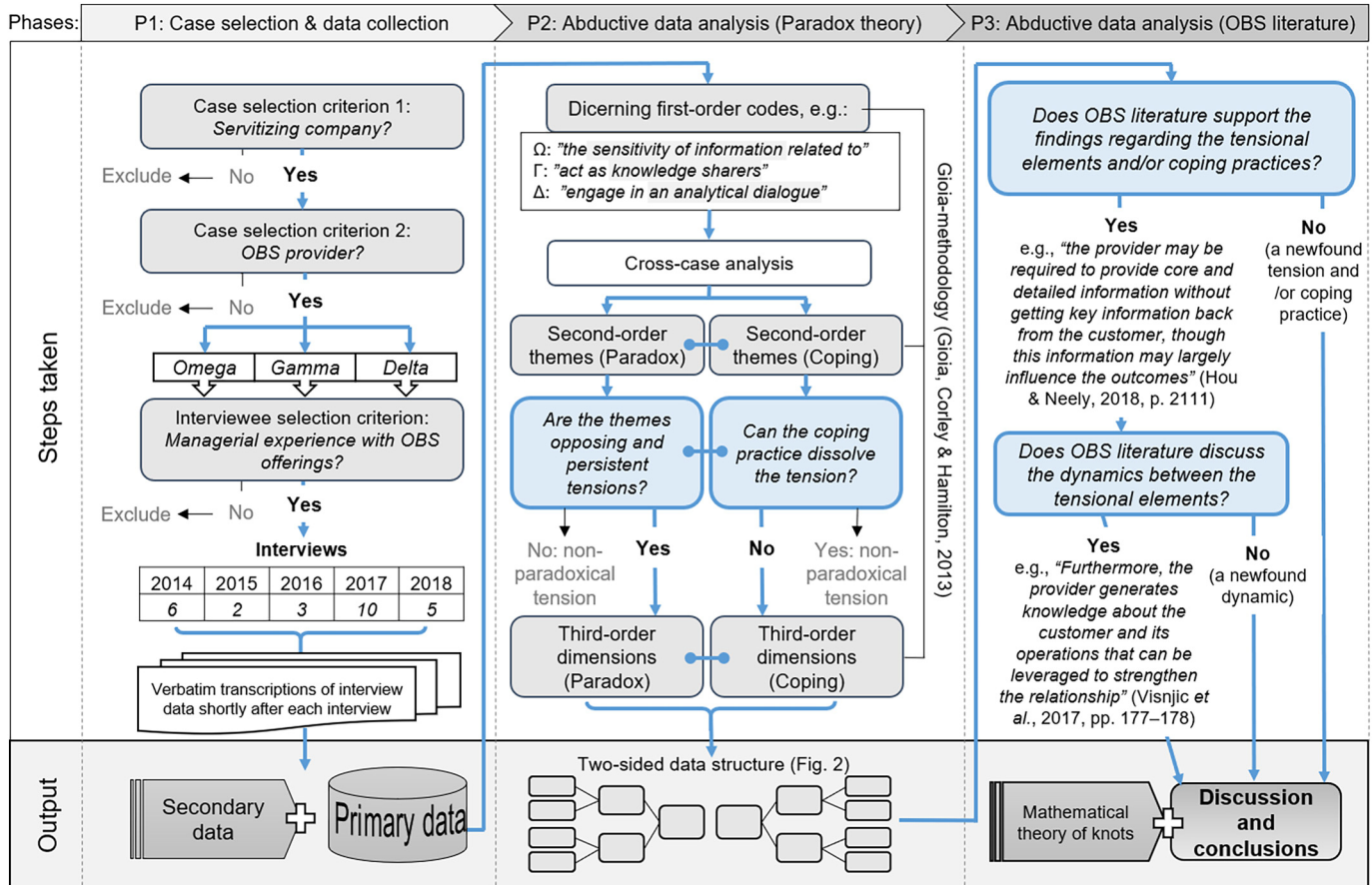


Fig. 1. Research process.

Appendix 2

Table 2

Examples of the first-order observations (paradoxes).

Case	Examples of the first-order observations	2.-order themes (Paradox)
Ω	"control over it" "depending on the country of origin and also the regulations at the time" "legal liabilities" "pay a lot more attention to terms and conditions in contracts"	Contract control
Γ	"customers who want to control everything" "liability aspect"	
Δ	"there's no way out other than court" "contractual penalties" "customer's lawyers pressure you" "It's quite heavy legally" "millions of liquidated damages pending"	
Ω	"reasonable split of responsibilities" "lengthy discussion and building trust" "we thrive to build trustful relationships"	Informal control
Γ	"...if customer does not trust you really" "difficult to control" "you should have a longstanding customer relationship"	
Δ	"long-term connection with the customers" "lessons learned" "understand their intention" "they are essentially looking for partners"	
Ω	"the sensitivity of information related to customer's production, operations, is emphasized"	Necessity of knowledge protection
Γ	"that's a bit sensitive" "increasingly hold our tongues"	
Δ	"But to put too many numbers in the face of the customer... you should be a bit conservative about how you present it"	
Ω	"information flow" "to get the same online data our customers get" "to get it on a level that knowledge is up to date and reliable" "root cause can be located and solved quickly"	Necessity of knowledge sharing
Γ	"access to all this knowledge" "you must principally share know-how" "experts must... act as knowledge sharers" "share it in advance"	
Δ	"thousands and thousands of hours of data to display" "there is an opportunity to make a lot of improvements over the life-cycle" "creating transparency for full life-cycle of an asset"	
Ω	"some just don't want to share their profits" "these projects cost a lot" "get our share of the portion" "because making a quotation process can be quite expensive" "sales processes are typically very long"	Individual business goals

(continued on next page)

Table 2 (continued)

Case	Examples of the first-order observations	2.-order themes (Paradox)
Γ	“agreements and transactional business” “their revenue model” “the broad offerings... they are a major obligation and a proper challenge”	Shared business goals
Δ	“it’s not sufficiently in line with our, with expectations our owners have” “we need to grow our installed base” “quick and very result-orientated” “short-term long-term dilemma”	
Ω	“it’s mutually beneficial relationship when it continues longer” “there must be a shared win-win” “what’s the long-term plan through which we want to generate added customer value”	
Γ	“and in a matrix organization it’s a challenge that these should be in harmony” “together with the customer build a roadmap”	
Δ	“business we do with our customers” “the co-creation between you and the customer has to be quite intense” “...being contractually dependent on how much customer captures value”	Difficult to imitate
Ω	“Your (service) sales is based on customer proximity, you know your customer” “it’s important for us to differentiate ourselves” “There the combined tech and (customer) process capability is a crucial point of differentiation.”	
Γ	“service-competence and capability precisely close to the customer” “you go to the customer interface and do the customer-specific applications or services”	
Δ	“...a more complex and more comprehensive value proposition” “everything is tailor-made” “there is no certain pattern” “Yeah, there are examples, but none of them are directly copyable.” “It is tailored, every case is tailored.”	Difficult to manage
Ω	“...higher volumes and the challenges associated with them.” “service-side is rather complex” “finding the source of the problem can be very complicated process” “...it can be an external factor causing the hiccup... not everything can be measured”	
Γ	“And when technologies change you should be able to stay on track on multiple levels” “... the world is ever complicating, our machines or equipment are more complex, so you need more multifaceted competence to fulfill customer needs.”	
Δ	“we have a lot of reviews, a lot of bureaucracy” “...it’s several competences that comes into play, compared to selling just some equipment.” “... starting to be quite complex”	

Appendix 3

Table 3

Examples of the first-order observations (coping strategies).

Case	Examples of the first-order observations	2.-order themes (Coping strategy)
Ω	“yeah, pull in the technology guys when you need, but first you need to build a relationship “we really are able to keep our promises” “to build long-standing relationships this way”	Demonstrating competence and intentions
Γ	“we have been successful” “create references” “long-term cooperation”	
Δ	“a long-term commitment” “the facility is a reference... which we can exhibit as our own” “having the same type of mindset in the first place”	
Ω	“...pull the client to your side. They will then support you” “focus on the existing customer base”	Leveraging past experiences
Γ	“leveraging relationships with customers” “the immense installed base is great reference” “existing customers”	
Δ	“We do a lot of business with customers we’ve done business with before.” “customer satisfaction”	Joint knowledge policy implementation
Ω	“we must assure customers, that information processing is confidential and secure”	
Γ	“So this kind of cause-and-effect relationship, we must be able to understand it”	
Δ	“listen your customer” “finally have a joint view” “openness to the assumptions you are using”	
Ω	“it must be bilateral” “you measure vibrations and you see how much different parts are wearing and stuff like that”	Reorienting provider identity
Γ	“what happens if... we haven’t shared in time?” “utilize online knowledge which is generated through our customer processes.”	
Δ	“engage in an analytical dialogue with the customer” “the digital solutions must be built based on what’s the business model like”	
Ω	“because we are a heavy engineering technology company and we have not always had the customers in focus, we have thought that they should be glad that they can buy our good technologies”	Further delegating accountability
Γ	“that you are an ‘automation-guy’... it’s a good starting point really, but it won’t cut it in the long run” “our history is very much based on technical capabilities”	
Δ	“our tradition when we’re only a product supplier” “to look a bit further to the future and bring new operation modes to accompany the old, traditional business.”	Compartmentalizing
Ω	“our strength is that... we can manage broader projects and even coordinate sub-contractors” “the further away from the math in our case you are, the more open you are to subcontract parts of your value creation.”	
Γ	“hands on-site... those come from external companies” “selected suppliers” “...it just makes no sense to have own blue-collar resources.”	
Δ	“sub-contracting” “external third-party partners” “nobody’s capable of doing this strictly alone” “you are giving them responsibilities”	Prioritizing
Ω	“...it is about finding specific pockets” “...even simple things have value sometimes.”	
Γ	“we need to place some competences very close to the customer, but at the same time keep some competences centralized to ensure efficiency” “it must be very concrete in the end”	Prioritizing
Δ	“I think it all starts from subsystems” “split it in the different small pieces” “So, through specific examples and accelerated sprints”	
Ω	“a firm this size can’t possibly be on top of every technology in every single market” “to establish the connections there in a standardized way enough” “our resource usage and structure must be extraordinarily flexible”	
Γ	“...when you stay in the hands-on zone, it starts to take shape pretty quickly that this is what we should focus on” “prioritization has happened”	Prioritizing
Δ	“These are strategic choices” “...that is in our service strategy one of the five main development areas that we really focus on.”	

Appendix 4

Table 4

Some illustrative quotes of the second-order categories leading to aggregate dimensions.

Case	OBS paradoxes	Coping strategies
	Control	Commitment
Ω	“If we know the customer, we know that we don’t have the certain risks you always have with new contract relationships” (2)	

(continued on next page)

Table 4 (continued)

Case	OBS paradoxes	Coping strategies
	<p>“So, we have no choice but to gain the trust. And with some, the trust is gained more easily.” (3)</p>	<p>“If you’ve got a good and close relationship through service, you’ve got advantage” (5) “And if you are able to help him in that phase, it’s much more likely that you will support them in the next life-cycle as well.” (9)</p>
Γ	<p>“Some projects can go brilliantly from customer perspective, but badly from our perspective.” (6) “...with some, occasionally, it happens that we start to arm wrestle, when the customer says that they could have found the cost-cut avenues themselves and thus are reluctant to pay our performance-based fee (3) “Because in certain markets the pressure is applied without any hesitation... So, if in absence of properly professional lawyers I would not agree to anything, I’ve seen too many bad examples.” (6)^a</p>	<p>“And you should be able to somehow, not guarantee it, but commit to it. It’s not only words but it’s also somehow showing in the agreement.” (5) “So, it’s crucial to find proper customers and then pilotize the new offering with them and then utilize the references, so that’s the only way actually in this industry.” (2) “So, it’s about being a valuable business partner in a way, not only being, let’s say, a factory that produces certain products and the products themselves then are the best or the cheapest or whatever.” (1) “All these variables are monitored and tracked against our decades-spanning statistics... then the customers basically roll out the red carpet “(6)</p>
Δ	<p>“...So it is easier to do consultancy if you like developing things together with the customer” (7) Knowledge</p>	<p>Openness “So, in these cases we try to find perhaps in our own installed base the pockets where we can place or add-on these analyzers and all.” (1)^a ...access to knowledge really depends on whether you have a good network of relationships in place” (4)</p>
Ω	<p>“Well, customer takes a certain risk, whether they feel that there are more pros than there are cons that we receive the information” (3)</p>	<p>“Before we made every installation component from interfaces, databases and of course the iron that goes to the system. Today, these systems are integrated to be a part of customer’s other information systems... so, we need to be able to adapt to the surrounding world as well.” (1)</p>
Γ	<p>“So the ownership of the knowledge is something that needs to be recognized. But there’s also a liability issue...” (4) “We’ve come across situations, where we teach someone to do special mechanical maintenance, and suddenly we notice they are our competitor. So, you need to be extremely careful.” (3)</p>	<p>“At least when you can do this kind of sensitivities, then it has a large value for the customers, then they really see that you are putting yourself into their shoes and they like that.” (7)^a ...the competitive advantage the original equipment manufacturer has is the knowledge... of what the equipment is capable of but also the entire system... This should be leveraged” (5)</p>
Δ	<p>“You will fast lose trust if you are stating some value quantifications early in the project that you cannot stand behind later when you... understand that ok, this is their assumptions, they are not the same as we have used” (7) “And another risk is that to operate a facility we need to recruit... And once they’ve been trained... they immediately switch employers” (6) Dependency</p>	<p>Partnerships “This business needs to be steered very carefully so, that this service business gets the resources, focus and also the managerial attention, which should not only be on the big transactions and that sort of business.” (4)^a ...to link suppliers’ contracts into the same contract environment we have with our customers” (10)</p>
Ω	<p>“Certainly, the contracts must be profitable for both the customer and us” (3) “Well, they are basically symbiotic. If we can’t generate installed base, it’s difficult to sell services.” (5)</p>	<p>“We pretty much operate through sub-suppliers. And we usually take on the supervisor role, while sub-suppliers bring in the resources” (3)^a ...you must have forums. There must be practices through which people can solve problems together and personal relationships must be formed between members of different organizations.” (8)</p>
Γ	<p>“It causes challenges, when these (equipment and OBS) are being sold together, they have different interests and premises.” (7) “Spare parts and consumables... looking at the returns, the role of these products is crucial.” (5) “...so, nowadays the situation is that we do everything to avoid spare part transactions.” (1) “And we are a corporation, a listed company, so we need to show the results every quarter” (2)</p>	<p>“But then, this can’t be done alone, you need multiple stakeholders brought together to get the wheels rolling... Firstly, you need global service network to manage the assets... Or alternatively partners with sufficient balance to handle it.” (4) “That was the challenge and partly is still today, because almost whatever we do, going forward is probably sacrificing something we do today” (8)</p>
Δ	<p>“And obviously this is more sort of long-term work where everything doesn’t pay off, so you need to balance it between how much resource do you put on these things that will not give you results in this quarter or even this year with the shorter term things.” (1) Complexity</p>	<p>Extrication “I think that is always the most critical as a manager to tell them that OK you can actually stop doing this and not focus on that one.” (8) “We try to concentrate on the essential. To solve problems by seeing that OK, that’s where it is, that’s the area, give or take. Isolating the location of the problem approximately.” (3) “There will always be contradictions, so the way we mitigate the conflicts is that people understand what’s the bigger picture we are trying to paint and then make the according solutions in their respective part of the matrix. And of course they will experience cross-pressure, but that’s purposeful in a sense.” (6) “And then focus is needed to identify the right ideas and focus on those and then develop those as projects.” (5) “...we concentrate resources there where we see statistically most prominent opportunities.” (6) “Then you go from an engine to entire engine room, and then to entire ship... Then you probably automate systems and finally autonomous ships are at the end of that evolution.” (4)</p>
Ω	<p>“The technological deliveries we offer are quite specific. So, in many ways, we fit into an extremely narrow niche.” (3) “...I certainly understand the external environment challenge, but also that you should very carefully consider which various things are affected by the changes you make internally.” (1)</p>	
Γ	<p>“So, the cooperation model with different customers, it varies a lot.” (5) “...we deal with significantly more complex models of customer’s processes. And not only concerning the production process, but it can be related to customer’s maintenance systems’ service programs or various quality information related to fuels, raw materials etc.” (1)</p>	
Δ	<p>“A lot of examples exist but I don’t think any of them are directly copiable... the business model for a single ship can be very different from another. They must be tailored accordingly... the equipment technical requirements grow constantly and they become increasingly complex” (4)</p>	

^aThe numbers in parenthesis after the quotes indicate the case-wise interviews in question.

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